Express Mail Label #EL799009639US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF YOUNG HOON PARK

FOR: ATOMIC LAYER DEPOSITION (ALD) THIN FILM DEPOSITION EQUIPMENT HAVING CLEANING APPARATUS AND CLEANING METHOD

PRELIMINARY AMENDMENT

"Express Mail" mailing label number EL799009639US
Date of Deposit May 3, 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.
Jennifer Matson
(Typed or printed name of person mailing paper or fee)
Jennifer Matson
(Signature of person mailing paper or fee)

The Assistant Commissioner of
Patents and Trademarks
Washington, DC 20231

Dear Sir:

Before examining the present application, please amend as follows:

IN THE SPECIFICATION:

Please accept the following specification paragraphs in re-written "clean form". The following paragraphs are the second to fifth paragraphs in the section entitled "SUMMARY OF THE INVENTION".

-- To achieve the above objective, the present invention provides an atomic layer deposition (ALD) thin film deposition equipment having a cleaning apparatus, this equipment including: a reactor in which a wafer is mounted and a thin film is deposited on the wafer; a first reaction gas supply portion for supplying a first reaction gas to the reactor; a second reaction gas supply portion for supplying a second reaction gas to the reactor; a first reaction gas supply line for connecting the first reaction gas supply portion to the reactor; a second reaction gas supply line for connecting the second reaction gas supply portion to the reactor; a first inert gas supply line for supplying an inert gas from

an inert gas supply source to the first reaction gas supply line; a second inert gas supply line for supplying the inert gas from the inert gas supply source to the second reaction gas supply line; an exhaust line for exhausting the gas from the reactor to the outside; and a cleaning gas supply line connected to the first reaction gas supply line for supplying a cleaning gas for cleaning the reactor. Here, the cleaning gas is ClF_3.

Preferably, the cleaning gas supply line includes: a cleaning gas mass flow controller (MFC) for controlling the flow of a supplied cleaning gas; and at least one valve for allowing or blocking the flow of the cleaning gas. Also, preferably, the cleaning gas supply line further includes a filter for filtering out foreign materials existing within the cleaning gas.

To achieve the above objective, the present invention provides a cleaning method for ALD thin film deposition equipment having a reactor including a reactor block on which a wafer is mounted, a wafer block installed within the reactor block, on which the wafer is seated, and a diffusion plate having a plurality of spray holes formed over the wafer block and a plurality of nozzles slanted toward the inner sidewall of the reactor block to spray a gas toward the edges of the wafer block. This cleaning method includes a main cleaning process performed in a state where no wafers are received within the reactor, for spraying a mixture of a cleaning gas and an inert gas onto the wafer through the spray holes and spraying an inert gas toward the edges of the wafer block through the nozzles.

Preferably, this cleaning method further includes a sub cleaning process performed in a state where no wafers are received within the reactor, for pulse-introducing the cleaning gas into the reactor to induce instantaneous diffusion due to a pressure fluctuation. Also, preferably, this cleaning method further includes a pre-coating process performed in a state where no wafers are received within the reactor, for adhering fine particles remaining within the reactor to the inside surface of the reactor.--

IN THE CLAIMS

Claims 1, 3, 5-6, 8, and 10-27 are presented as follows in re-written "clean" format.

--1. (Amended) An atomic layer deposition (ALD) thin film deposition equipment including a cleaning apparatus, comprising:

a reactor in which a wafer is mounted and a thin film is deposited on the wafer;

a first reaction gas supply portion for supplying a first reaction gas to the reactor;

a second reaction gas supply portion for supplying a second reaction gas to the reactor;

a first reaction gas supply line for connecting the first reaction gas supply portion to the reactor;

a second reaction gas supply line for connecting the second reaction gas supply portion to the reactor;

a first inert gas supply line for supplying an inert gas from an inert gas supply source to the first reaction gas supply line;

a second inert gas supply line for supplying the inert gas from the inert gas supply source to the second reaction gas supply line;

an exhaust line for exhausting the gas from the rector; and

a cleaning gas supply line connected to the first reaction gas supply line for supplying a cleaning gas for cleaning the reactor.--

--3. (Amended) The ALD thin film deposition equipment of claim 1, wherein the cleaning gas supply line comprises:

a cleaning gas mass flow controller for controlling the flow of a supplied cleaning gas; and

at least one valve for allowing or blocking the flow of the cleaning gas.--

--5. (Amended) The ALD thin film deposition equipment of claim 3, wherein the cleaning gas supply line further comprises a filter for filtering out foreign materials

existing within the cleaning gas.--

--6. (Amended) The ALD thin film deposition equipment of claim 1, wherein the first reaction gas supply portion comprises:

a bubbler for gasifying a first reaction material to form the first reaction gas;

a first reaction gas mass flow controller for controlling the flow of a first reaction gas supplied from the bubbler; and

a first valve installed on a line between the bubbler and the first reaction gas mass flow controller for allowing or blocking the flow of the first reaction gas.--

--8. (Amended) The ALD thin film deposition equipment of claim 1, wherein a first reaction gas supply portion comprises:

a thirty first valve for allowing or blocking the flow of the first reaction gas; and

a first reaction gas mass flow controller for controlling the flow of the first reaction gas which has passed through the thirty first valve.--

--10. (Amended) The ALD thin film deposition equipment of claim 1, further comprising:

a third reaction gas supply portion for supplying a third reaction gas to the second reaction gas supply line; and

a fourth reaction gas supply portion for supplying a fourth reaction gas to the second reaction gas supply line,

wherein the fourth reaction gas supply portion has a thirty second valve for allowing or blocking the flow of a fourth reaction gas, a fourth reaction gas mass flow controller for controlling the flow of the fourth reaction gas which has passed through the thirty second valve, and a thirty third valve for allowing or blocking the flow of the fourth reaction gas which has been controlled by the fourth reaction gas mass flow controller.--

--11. (Amended) The ALD thin film deposition equipment of claim 10, wherein the third reaction gas supply portion comprises:

a bubbler for gasifying a third reaction material to form the third reaction gas;

a third reaction gas mass flow controller for controlling the flow of the third reaction gas supplied from the bubbler;

a thirty fourth valve installed on a line between the bubbler and the third reaction gas mass flow controller for allowing or blocking the flow of the third reaction gas; and

a thirty fifth valve for allowing or blocking the flow of the third reaction gas, which has been controlled by the third reaction gas mass flow controller, to the second reaction gas supply line.--

--12. (Amended) The ALD thin film deposition equipment of claim 10, wherein the first reaction gas is a compound gas containing a transfer metal element selected from the group consisting of Ti, Ta and W, the second reaction gas is NH_3, the third reaction gas is TriMethylAluminum (TMA), and the fourth reaction gas is H_2.--

--13. (Amended) The ALD thin film deposition equipment of claim 1, wherein the reactor comprises:

a reactor block on which a wafer is mounted;

a shower head plate for maintaining a predetermined pressure constant by covering the reactor block;

a diffusion plate installed on a lower surface of the shower head plate, the diffusion plate having a plurality of spray holes formed over the wafer to spray the first reaction gas and/or inert gas transferred via the first reaction gas supply line onto the upper surface of the wafer, and a plurality of nozzles slanted toward the inner sidewall of the reactor block to spray the second reaction gas and/or inert gas transferred via the second reaction gas supply line; and

a wafer block installed within the reactor block, on which the wafer is seated.--

--14. (Amended) The ALD thin film deposition equipment of claim 13, further comprising a coolant passage in the shower head plate in order to decrease the temperature of the diffusion plate to a desired temperature range.--

--15. (Amended) A cleaning method for an ALD thin film deposition equipment comprising a reactor including a reactor block on which a wafer is mounted, a wafer block installed within the reactor block, on which the wafer is seated, and a diffusion plate having a plurality of spray holes formed over the wafer block and a plurality of nozzles slanted toward the inner sidewall of the reactor block to spray a gas toward the edges of the wafer block, the cleaning method comprising:

performing a main cleaning process in a state where no wafers are received within the reactor, including spraying a mixture of a cleaning gas and an inert gas onto the wafer through the spray holes and spraying the inert gas toward edges of the wafer block through the nozzles.--

--16. (Amended) The cleaning method of claim 15, wherein the main cleaning process further comprises setting the flow rate of the cleaning gas 50 SCCM or higher, and the inert gas mixed with the cleaning gas to the spray holes to be at 50 SCCM or higher, and setting the flow rage of the inert gas to the nozzles to be at 300 SCCM or higher.--

--17. (Amended) The cleaning method of claim 16, further comprising setting the inside pressure of the reactor to be 0.5 to 10 torr.--

--18. (Amended) The cleaning method of claim 16, further comprising setting the inside surface temperature of the reactor except for the wafer block to be 200 °C or less.--

--19. (Amended) The cleaning method of claim 15, further comprising performing a sub cleaning process in a state where no wafers are received within the reactor, including pulse-introducing the cleaning gas into the reactor to induce instantaneous diffusion due to a pressure fluctuation.--

--20. (Amended) The cleaning method of claim 19, wherein the sub cleaning process further comprises setting the flow rate of the cleaning gas to be at 50 SCCM or higher, setting the flow rate of the inert gas mixed with the cleaning gas to the spray holes

to be at 50 SCCM or higher, and setting the flow rate of the inert gas to the nozzles to be at 300 SCCM or higher.--

--21. (Amended) The cleaning method of claim 19, further comprising setting the inside pressure of the reactor to be 0.5 to 10 torr.--

--22. (Amended) The cleaning method of claim 19, further comprising setting the inside surface temperature of the reactor except for the wafer block to be 200 °C or less.--

--23. (Amended) The cleaning method of claim 15, further comprising performing a pre-coating process in a state where no wafers are received within the reactor, including adhering fine particles remaining within the reactor to the inside surface of the reactor.--

--24. (Amended) The cleaning method of claim 23, wherein the pre-coating process comprises spraying a first mixture gas of a first reaction gas and the inert gas onto the wafer block through the spray holes, and spraying a second mixture gas of a second reaction gas and the inert gas toward edges of the wafer block through the nozzles.--

--25. (Amended) The cleaning method of claim 23, wherein the pre-coating process comprises introducing a first mixture gas of a first reaction gas and the inert gas; introducing the inert gas without the first reaction gas for a predetermined period of time; introducing a second mixture gas of a second reaction gas and the inert gas into the reactor; and introducing the inert gas without the second reaction gas for a predetermined period of time.--

--26. (Amended) The cleaning method of claim 23, wherein the pre-coating process comprises introducing a first mixture gas of a first reaction gas and the inert gas and introducing the inert gas without the first reaction gas for a predetermined period of time in a state where a second reaction gas and the inert gas are continuously introduced

into the reactor.--

--27. (Amended) The cleaning method of claim 23, wherein the pre-coating process comprises introducing NH_3 gas into the reactor at least several seconds before introducing a first reaction gas into the reactor, when a compound gas containing Cl is used as the first reaction gas, and the NH_3 gas is used as a second reaction gas.--

IN THE ABSTRACT

Please replace the Abstract with the following rewritten, amended Abstract.

-- An atomic layer deposition (ALD) thin film deposition equipment having a cleaning apparatus, this equipment including a reactor in which a wafer is mounted and a thin film is deposited on the wafer, a first reaction gas supply portion for supplying a first reaction gas to the reactor, a second reaction gas supply portion for supplying a second reaction gas to the reactor, a first reaction gas supply line for connecting the first reaction gas supply portion to the reactor, a second reaction gas supply line for connecting the second reaction gas supply portion to the reactor, a first inert gas supply line for supplying an inert gas from an inert gas supply source to the first reaction gas supply line, a second inert gas supply line for supplying the inert gas from the inert gas supply source to the second reaction gas supply line, an exhaust line for exhausting the gas from the reactor to the outside, and a cleaning gas supply line connected to the first reaction gas supply line for supplying a cleaning gas for cleaning the reactor.--

REMARKS

Applicant requests entry of the present amendments which conform the claims to U.S. practice. No new matter is being introduced by this Amendment as antecedent support is set forth in the original specification and in the original claims.

Prosecution on the merits is respectfully requested.

The Examiner is invited to contact Applicant's Attorneys at the below-listed telephone number regarding this Preliminary Amendment or otherwise regarding the present application.

If there are any charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicant's attorneys.

Respectfully submitted,
YOUNG HOON PARK

CANTOR COLBURN LLP
Applicant's Attorneys

By: _____

Daniel F. Drexler
Registration No. 47,535
Customer No. 23413

Date: May 03, 2001
Address: 55 Griffin Road South, Bloomfield, CT 06002
Telephone: 860-286-2929

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The second to fifth paragraphs under the section title "SUMMARY OF THE INVENTION", on the second page of the specification are amended as follows:

"To achieve the above objective, the present invention provides an atomic layer deposition (ALD) thin film deposition equipment having a cleaning apparatus, this equipment including: a reactor [100] in which a wafer is mounted and a thin film is deposited on the wafer; a first reaction gas supply portion [210] for supplying a first reaction gas to the reactor [100]; a second reaction gas supply portion [230] for supplying a second reaction gas to the reactor [100]; a first reaction gas supply line [220] for connecting the first reaction gas supply portion [210] to the reactor [100]; a second reaction gas supply line [240] for connecting the second reaction gas supply portion [230] to the reactor [100]; a first inert gas supply line [260] for supplying an inert gas from an inert gas supply source [250] to the first reaction gas supply line [220]; a second inert gas supply line [270] for supplying [an] the inert gas from the inert gas supply source [250] to the second reaction gas supply line [240]; an exhaust line [400] for exhausting the gas [within] from the [rector 100] reactor to the outside; and a cleaning gas supply line [340] connected to the first reaction gas supply line [220] for supplying a cleaning gas for cleaning the reactor [100]. Here, the cleaning gas is ClF_3.

Preferably, the cleaning gas supply line [340] includes: a cleaning gas mass flow controller (MFC) for controlling the flow of a supplied cleaning gas; and at least one valve for allowing or blocking the flow of the cleaning gas. Also, preferably, the cleaning gas supply line [340] further includes a filter for filtering out foreign materials existing within the cleaning gas.

To achieve the above objective, the present invention provides a cleaning method for ALD thin film deposition equipment having a reactor [100] including a reactor block [110] on which a wafer is mounted, a wafer block [140] installed within the reactor block [110], on which the wafer [w] is seated, and a diffusion plate having a plurality of spray holes [131] formed over the wafer block [140] and a plurality of nozzles [133] slanted

toward the inner sidewall of the reactor block [110] to spray a gas toward the edges of the wafer block [140]. This cleaning method includes a main cleaning process performed in a state where no wafers are received within the reactor [100], for spraying a mixture of a cleaning gas and an inert gas onto the wafer [w] through the spray holes [131] and spraying an inert gas toward the edges of the wafer block [140] through the nozzles [133].

Preferably, this cleaning method further includes a sub cleaning process performed in a state where no wafers are received within the reactor, for pulse-introducing the cleaning gas into the reactor [100] to induce instantaneous diffusion due to a pressure fluctuation. Also, preferably, this cleaning method further includes a pre-coating process performed in a state where no wafers are received within the reactor, for adhering fine particles remaining within the reactor to the inside surface of the reactor. "

IN THE CLAIMS

A "marked up" version of Claims 1, 3, 5-6, 8, and 10-27 follows:

1. (Amended/Marked up) An [A]atomic layer deposition (ALD) thin film deposition equipment including a cleaning apparatus, comprising:

a reactor [100] in which a wafer is mounted and a thin film is deposited on the wafer;

a first reaction gas supply portion [210] for supplying a first reaction gas to the reactor [100];

a second reaction gas supply portion [230] for supplying a second reaction gas to the reactor [100];

a first reaction gas supply line [220] for connecting the first reaction gas supply portion [210] to the reactor [100];

a second reaction gas supply line [240] for connecting the second reaction gas supply portion [230] to the reactor [100];

a first inert gas supply line [260] for supplying an inert gas from an inert gas supply source [250] to the first reaction gas supply line [220];

a second inert gas supply line [270] for supplying [an] the inert gas from the inert gas supply source [250] to the second reaction gas supply line [240];

an exhaust line [400] for exhausting the gas [within] from the rector [100 to the outside]; and

a cleaning gas supply line [340] connected to the first reaction gas supply line [220] for supplying a cleaning gas for cleaning the reactor [100].

3. (Amended/Marked up) The ALD thin film deposition equipment of claim 1, wherein the cleaning gas supply line [340] comprises:

a cleaning gas mass flow controller [(MFC)] for controlling the flow of a supplied cleaning gas; and

at least one valve for allowing or blocking the flow of the cleaning gas.

5. (Amended/Marked up) The ALD thin film deposition equipment of claim 3, wherein the cleaning gas supply line [340] further comprises a filter for filtering out foreign materials existing within the cleaning gas.

6. (Amended/Marked up) The ALD thin film deposition equipment of claim 1, wherein the first reaction gas supply portion [210] comprises:

a bubbler [211] for gasifying a first reaction material to form the first reaction gas;

a first reaction gas mass flow controller [(MFC) 212] for controlling the flow of a first reaction gas supplied from the bubbler [211]; and

a first valve [V1] installed on [the] a line between the bubbler [211] and the first reaction gas mass flow controller [MFC 212] for allowing or blocking the flow of the first reaction gas.

8. (Amended/Marked up) The ALD thin film deposition equipment of claim 1, wherein a first reaction gas supply portion [510] comprises:

a thirty first valve [V31] for allowing or blocking the flow of [a] the first reaction gas [supplied]; and

a first reaction gas mass flow controller [MFC 512] for controlling the flow of [a

second] the first reaction gas which has passed through the thirty first valve [V31].

10. (Amended/Marked up) The ALD thin film deposition equipment of claim 1, further comprising:

a third reaction gas supply portion [620] for supplying a third reaction gas to the second reaction gas supply line [240]; and

a fourth reaction gas supply portion [610] for supplying a fourth reaction gas to the second reaction gas supply line [240],

wherein the fourth reaction gas supply portion [610] has a thirty second valve [V32] for allowing or blocking the flow of a fourth reaction gas [supplied], a fourth reaction gas mass flow controller [MFC 612] for controlling the flow of [a] the fourth reaction gas which has passed through the thirty second valve [V32], and a thirty third valve [V33] for allowing or blocking the flow of [a] the fourth reaction gas which has been controlled by the fourth reaction gas mass flow controller [MFC 612].

11. (Amended/Marked up) The ALD thin film deposition equipment of claim 10, wherein the third reaction gas supply portion [620] comprises:

a bubbler [621] for gasifying a third reaction material to form the third reaction gas;

a third reaction gas mass flow controller [MFC 622] for controlling the flow of the third reaction gas supplied from the bubbler [621];

a thirty fourth valve [V34] installed on [the] a line between the bubbler [621] and the third reaction gas mass flow controller [MFC 622] for allowing or blocking the flow of the third reaction gas; and

a thirty fifth valve [V35] for allowing or blocking the flow of the third reaction gas, which has been controlled by the third reaction gas mass flow controller [MFC 622], to the second reaction gas supply line [240].

12. (Amended/Marked up) The ALD thin film deposition equipment of claim 10, wherein the first reaction gas is a compound gas containing a transfer metal element selected from the group consisting of [such as] Ti, Ta [or] and W, the second reaction gas

is NH_3, the third reaction gas is TriMethylAluminum (TMA), and the fourth reaction gas is H_2.

13. (Amended/Marked up) The ALD thin film deposition equipment of claim 1, wherein the reactor [100] comprises:

a reactor block [110] on which a wafer is mounted;

a shower head plate [120] for maintaining a predetermined pressure constant by covering the reactor block [110];

a diffusion plate installed on [the bottom] a lower surface of the shower head plate [120], the diffusion plate having a plurality of spray holes [131] formed over the wafer [**w**] to spray [a] the first reaction gas and/or inert gas transferred via the first reaction gas supply line [220] onto the upper surface of the wafer [**w**], and a plurality of nozzles [133] slanted toward the inner sidewall of the reactor block [110] to spray [a] the second reaction gas and/or inert gas transferred via the second reaction gas supply line [240]; and

a wafer block [140] installed within the reactor block [110], on which the wafer [**w**] is seated.

14. (Amended/Marked up) The ALD thin film deposition equipment of claim 13, [wherein] further comprising a coolant passage [123 is formed] in the shower head plate [120] in order to decrease the temperature of the diffusion plate [130] to a desired temperature range.

15. (Amended/Marked up) A cleaning method for an ALD thin film deposition equipment [having] comprising a reactor [100] including a reactor block [110] on which a wafer is mounted, a wafer block [140] installed within the reactor block [110], on which the wafer [**w**] is seated, and a diffusion plate having a plurality of spray holes [131] formed over the wafer block [140] and a plurality of nozzles [133] slanted toward the inner sidewall of the reactor block [110] to spray a gas toward the edges of the wafer block [140], the cleaning method comprising:

performing a main cleaning process [performed] in a state where no wafers are

received within the reactor [100], [for] including spraying a mixture of a cleaning gas and an inert gas onto the wafer [w] through the spray holes [131] and spraying [an] the inert gas toward [the] edges of the wafer block [140] through the nozzles [133].

16. (Amended/Marked up) The cleaning method of claim 15, wherein, [in] the main cleaning process[,] further comprises setting the flow rate of the [a] cleaning gas [flows at] 50 SCCM or higher, [an] and the inert gas [is] mixed with the cleaning gas [and flows] to the spray holes [131] to be at 50 SCCM or higher, and setting the flow rage of the [an] inert gas [flows] to the nozzles [133] to be at 300 SCCM or higher.

17. (Amended/Marked up) The cleaning method of claim 16, [wherein, in the main cleaning process,] further comprising setting the inside pressure of the reactor [100 is set] to be 0.5 to 10 torr.

18. (Amended/Marked up) The cleaning method of claim 16, [wherein, in the main cleaning process,] further comprising setting the inside surface temperature of the reactor [100] except for the wafer block [140 is set] to be 200 °C or less.

19. (Amended/Marked up) The cleaning method of claim 15, further comprising performing a sub cleaning process [performed] in a state where no wafers are received within the reactor, [for] including pulse-introducing the cleaning gas into the reactor [100] to induce instantaneous diffusion due to a pressure fluctuation.

20. (Amended/Marked up) The cleaning method of claim 19, wherein[, in] the sub cleaning process[,] further comprises setting the flow rate of the [a] cleaning gas [flows] to be at 50 SCCM or higher, setting the flow rate of the [an] inert gas [is] mixed with the cleaning gas [and flows] to the spray holes [131] to be at 50SCCM or higher, and setting the flow rate of the [an] inert gas [flows] to the nozzles [133] to be at 300SCCM or higher.

21. (Amended/Marked up) The cleaning method of claim 19, [wherein, in the sub

cleaning process,] further comprising setting the inside pressure of the reactor [100 is set] to be 0.5 to 10 torr.

22. (Amended/Marked up) The cleaning method of claim 19, [wherein, in the sub cleaning process,] further comprising setting the inside surface temperature of the reactor [100] except for the wafer block [140 is set] to be 200 °C or less.

23. (Amended/Marked up) The cleaning method of claim 15, further comprising performing a pre-coating process [performed] in a state where no wafers are received within the reactor, [for] including adhering fine particles remaining within the reactor to the inside surface of the reactor.

24. (Amended/Marked up) The cleaning method of claim 23, wherein the pre-coating process [is performed by] comprises [mixing the first reaction gas and the inert gas and] spraying a first mixture gas of a first reaction gas and the inert gas [the gas mixture] onto the wafer block through the spray holes [131], and [mixing the second reaction gas and the inert gas and] spraying a second mixture gas of a second reaction gas and the inert gas [the gas mixture] toward [the] edges of the wafer block through the nozzles [133].

25. (Amended/Marked up) The cleaning method of claim 23, wherein the pre-coating process [is performed by] comprises [repeating a first step of mixing and] introducing a first mixture gas of [the] a first reaction gas and the inert gas; [and] introducing the inert gas without [excluding] the first reaction gas for a predetermined period of time;[, and a second step of] introducing a second mixture gas of [the] a second reaction gas and the inert gas into the reactor [100]; and introducing the inert gas without [excluding] the second reaction gas for a predetermined period of time.

26. (Amended/Marked up) The cleaning method of claim 23, wherein the pre-coating process [is performed by repeating] comprises [a first step of mixing and] introducing a first mixture gas of [the] a first reaction gas and the inert gas and

introducing the inert gas without [excluding] the first reaction gas for a predetermined period of time[, while] in a state where [the] a second reaction gas and the inert gas are continuously introduced into the reactor [100].

27. (Amended/Marked up) The cleaning method of claim 23, wherein [in] the pre-coating process[, an] comprises introducing NH_3 gas [is introduced] into the reactor [100] at least several seconds before introducing a first reaction gas [is introduced] into the reactor [100], when a compound gas containing Cl is used as the first reaction gas, and the NH_3 gas is used as [the] a second reaction gas.

IN THE ABSTRACT

A marked up version of the Abstract follows:

"An atomic layer deposition (ALD) thin film deposition equipment having a cleaning apparatus, this equipment including a reactor [100] in which a wafer is mounted and a thin film is deposited on the wafer, a first reaction gas supply portion [210] for supplying a first reaction gas to the reactor [100], a second reaction gas supply portion [230] for supplying a second reaction gas to the reactor [100], a first reaction gas supply line [220] for connecting the first reaction gas supply portion [210] to the reactor [100], a second reaction gas supply line [240] for connecting the second reaction gas supply portion [230] to the reactor [100], a first inert gas supply line [260] for supplying an inert gas from an inert gas supply source [250] to the first reaction gas supply line [220], a second inert gas supply line [270] for supplying [an] the inert gas from the inert gas supply source [250] to the second reaction gas supply line [240], an exhaust line [400] for exhausting the gas [within] from the [rector 100] reactor to the outside, and a cleaning gas supply line [340] connected to the first reaction gas supply line [220] for supplying a cleaning gas for cleaning the reactor [100]."